

M A G E L L A NTM

V1.1 Manual Addendum

Introduction

Purpose of the Version 1.1 Upgrade to MAGELLAN™

MAGELLAN is as much a direction as a product. With more than 1500 end-users working with our product, we have learned a great deal about what the user wants for an interface. We have tried to integrate as many of these suggestions as were possible, with a constant eye to the overall consistency and flow of the product.

We feel that our end-users are the best source of these suggestions, as you are the people who ultimately make a product productive. Most of the suggestions we received regarded the implementation of the user interface: "add scrollable windows", "use more color", etc. There were very few suggestions concerning the inference engine, certainty algorithms, etc. This indicates a growing familiarity with the product; as users become more familiar with using the product, they will find flaws and weaknesses in the user-interface. Ultimately, users may uncover weaknesses in the under-lying software implementation - bugs. After some more time, a very few users may discover limitations in the concept of the product - ways that the product's overall architecture or design is contrary with the goals of the product.

So far, we have had many comments about the interface. We believe these comments are important - so important that we try to respond to each comment. MAGELLAN is a direction, and the direction of the product comes from the final authority - the end users. We have made a great many changes in this release of the product, and we hope that we have not fixed many things that weren't broken. The fundamental method of building rules and attaching TEXT files or IFF pictures as results has not changed.

Again, we are asking for your comments. Please feel free to challenge an interface change or to suggest a different method of implementation. Suggest away. We have started a program at Emerald Intelligence called the Green Team. You are a member of the Green Team - the users who buy our products and give us a chance to do something even neater with each new product or new release.

We think of MAGELLAN as a direction, and its ongoing revision and improvement are very important: here at Emerald as well as to the members of the Green Team who have invested in it. Thank you for your support.

Significant Changes in MAGELLAN V1.1

MAGELLAN has changed. Most of the changes are cosmetic, but there are subtle differences in the methods used to create, edit or use knowledgebases. Significant changes include:

- Addition of Scroll Bars to Display Windows
- Automatic Legal Values
- Automatic Object-Attribute Typing
- GET and PUT Operators
- Inquiry File Processes
- Selection of Rules and Objects for Editing
- User Environment Display Options
- User Environment Command Options
- Front End Interfaces
- Menus and Control Window Changes
- Addition of Control Buttons
- New File Requester
- New Hard Disk Installation Routine
- Rule Editing/Creation Verification
- Useless Cell Deletion
- Object Edit Options
- Loop Inference Mode
- Memory Checking
- Termination Options
- Magellan Startup and New Knowledgebases
- Knowledgebase Conversion from 1.0
- MSGv1.1 and Menu Selection Text

New Scroll Bars

Displaying of rules, objects (formerly 'cells'), words, etc., can now be done without clicking mouse buttons to stop the scrolling. Display windows now have scroll bars that are useful to view just a portion of a display.

To use the scroll bars, select the 'thumb' of the scroll bar by clicking the left mouse button and holding it down. Sliding the scroll bar up or down to a new position will reset the displayed portion of the data. Clicking into the container of the scroll bar will move the scroll bar 'thumb' up and down into the displayable data. If the display is not current after moving the scroll bar up or down, simply click again on the scroll bar thumb after moving it.

The position of the scroller is remembered: if you were displaying a section of three rules somewhere in the middle of the rule list, those three rules would likely be displayed the next time the rule display window is opened.

Automatic Legal Values

Although the legal values feature on MAGELLAN 1.0 was very useful, it could be tedious to create the legal values buttons. In V1.1, we have eliminated that step altogether. Legal values (actually now called 'automatic values') are created automatically by Magellan from the possible answers in the rules. Text values are supported, currently, numeric values, such as '3.25', are not .

Automatic Object-Attribute Typing

Under MAGELLAN 1.0, the type' of a cell was determined by analysis of the value assigned to that cell. If a rule concluded:

THEN
the DOG NAME is BOZO

then a text type was correctly assigned to the cell. If it concluded:

THEN
the DOG WEIGHT is 12.5

a numeric type was automatically assigned the cell DOG WEIGHT. This worked most of the time, but was difficult to use with text data including numerics, such as phone numbers, addresses, etc. The conclusion:

THEN
DOG ADDRESS is 2345 STAR LANE

would improperly expect a floating point number for valuation.

Version 1.1 resolves this inconsistency by using the OPERATOR field to determine type:

IF
DOG NAME is BOZO
THEN
DOG WEIGHT = 12.5
and DOG ADDRESS is 2345 MOCKINGBIRD LANE

The use of the equals sign (=) in the operator field of the first THEN clause defines its value as a numeric type, and the use of 'is' in the operator field of the second clause defines its value as a text type.

The results of the GET operation are also determined by the use of operators: the GET# operator forces the evaluation of the gotten data as a numeric value (IEEE 64 bit floating point), where the GET operator forces evaluation as a text string. The target cell for GET to return a value to will determine the final typing of the data acquired.

GET and PUT Operators

To be truly useful, an expert system sometimes requires data maintained in conventional software. A company may have thousands of hours of work in a conventional database, and may wish to hook an expert system to it. MAGELLAN permits access to external programs and data via the GET/PUT operators. Specialized programs can be created to retrieve information from virtually any program. Additionally, the MAGELLAN Interface Toolkit (another product from Emerald Intelligence) can be used to hook to LOTUS 1-2-3™ compatible spreadsheets (Analyze!™ and MaxiPlan™) and also to databases created with SuperBase™. The INTERFACE TOOLKIT provides these 'hooks' for MAGELLAN to use via the GET/PUT feature. Additionally, the INTERFACE TOOLKIT provides source code (in 'C') for some of the interfaces provided. This is a big help to users who wish to create their own interfaces to programs of their own.

Using GET/PUT

Without the INTERFACE TOOLKIT, MAGELLAN can still make effective use of the new GET/PUT features. What is required is more effort on the part of the user. Creating a rule that uses the GET function is quite simple. Imagine a file (parts.file) has been created that contains the following information about parts in inventory:

name	number	price	count	weight
WIDGET	2134567	1.25	320	12.3
SMERMAK	3456777	.75	2100	2.6

Obtaining this information, and using MAGELLAN to determine how many SMERMAKS are in inventory, or how to ship a WIDGET based on weight is not complicated. A single rule could be used to obtain the information from the file 'parts.file', using a stand-alone program (this is the extra effort part) called PARTIO that would open a file (parts.file), find a 'record' for a part by name (WIDGET) , and take the first, second, third or fourth character string in that file, based on whether it was looking for the PART NAME's number, price, count or weight respectively. Here's the rule:

IF

 part name is WIDGET
and part data is desired

THEN

part number	GET	partio	parts.file	WIDGET	NUMBER
part price	GET#	partio	parts.file	WIDGET	PRICE
part count	GET#	partio	parts.file	WIDGET	COUNT
part weight	GET#	partio	parts.file	WIDGET	WEIGHT

Note the GET, GET# operators. The four THEN part operators all do the same sort of thing: they run a program called PARTIO (that you have created.. again the extra effort part), sending it several arguments, including:

PARTS.FILE -a file name to read data from

WIDGET - the part name passed to partio

NUMBER,PRICE,COUNT or WEIGHT

an argument showing which data element: number, weight, price or count,
to retrieve for MAGELLAN

Backward chaining on part weight, for example, would ask the user for part name and whether the part data is desired. Once MAGELLAN is given both the name and the correct answer to the part data desired question, the GET's and GET#'s would instantiate the value of the object attributes they are hooked to in the THEN part of the rule.

GET/PUT Protocol

The MAGELLAN INTERFACE TOOLKIT makes the following much easier, as source code is supplied to base your interface programs on. When acting on a GET, GET#, PUT or PUT# operator, MAGELLAN takes the value part of the rule clause containing the GET or PUT-type operator and sends several command line arguments to an external program.

For example, from the previous rule:

THEN

part number GET [PARTIO parts.file name number]

sends the bracketed text to the AMIGA CLI, along with some additional necessary terms:

PARTIO getfname.tmp R blah parts.file name number

This is just as if you had typed it into the CLI. Let's examine the command line arguments:

PARTIO - the name of the program to run (YOU MUST SUPPLY)

getfname.tmp - a temporary file (from MAGELLAN)

R - read mode (from MAGELLAN - this is a GET, not a PUT)

blah - data to write (from MAGELLAN - not used in GET's)

parts.file - 1st argument to PARTIO - a filename (YOU SUPPLY)

name- 2nd arg. to PARTIO - a part name to look up (YOU SUPPLY)

number - 3rd arg. to PARTIO -the part number is desired (YOU SUPPLY)

So, the protocol for a GET program is the following:

Using the standard command line arguments in 'C':

argv[0] -- the name of the program used to 'GET' the data

argv[1] -- temporary filename to send data back to MAGELLAN in

argv[2] -- "R" or "W" meaning that MAGELLAN has commanded a
read or a write from the program

argv[3] -- data from MAGELLAN if this is a WRITE to the program

argv[4] to argv[9] additional parameters for the called program,
such as filenames to open, search strings, graphics positions or
anything else needed to be passed from MAGELLAN to the
program.

In the value portion of a clause with a GET or PUT operator, several of
these arguments can be provided:

IF

get data is desired

THEN

data value GET { argv[0] argv[4] argv[5] argv[n] }

When the CLI command is created by MAGELLAN to actually do a GET
or PUT, it will add argv[1], argv[2], and argv[3].

To do a GET: Your program needs to:

- set the environment variable "GETIO" to "PENDING" (this may be
done using the setenv() function in MANX AZTEC 'C')
- open a file named with the string sent in argv[1]
- interpret the later argv[]'s [4] to [9] if necessary, and perform any work
- write your data into the file named in argv[1]
- close the file named in argv[1]
- set the environment variable "GETIO" to "COMPLETED"
- return

To do a PUT: Your program needs to:

- set the environment variable "GETIO" to "PENDING" (this may be done using the setenv() function in MANX AZTEC 'C')
- use the data provided in argv[3], if desired.
- interpret the later argv[]'s [4] to [9] if necessary, and perform any work
- set the environment variable "GETIO" to "COMPLETED"
- return

Inquiry File Processes

Similar to GET, any object-attribute (CELL) in MAGELLAN can be hooked to a process, so that when a value is needed for the cell as a result of inference, a process (like GET) will call a program and obtain an answer, instead of asking the user. A spreadsheet might contain a value required in inference. The cell 'SPREADSHEET VALUE' would be given an INQUIRYFILE by editing in the object select/edit window. When the cell SPREADSHEET VALUE is required as a goal in backchaining, the inquiry file program is run instead of asking the user.

Selection of Rules and Objects for Editing

Selection of rules and objects for editing is now accomplished by using arrow keys and seeing the full text of a rule or object displayed. Selection by rule number is still maintained, but is much easier to use. Creation, modification, deletion, etc., are all done with the selected rule being displayed. The MAGELLAN 1.0 method of SELECT then EDIT/DELETE, etc., has been revised so that selection is a more intuitive step. UNDO is supported and the UNDO buffer is automatically updated before each change- so you can usually recover from a misstep.

To edit a rule:

-- Select the rule using the Select/Edit menu selection of the RULES menu:

(either type in the rule number desired, followed by clicking the FIND button, or just click the FIND button to start at the top of the list of rules)

This causes two arrow buttons to appear (<-- and -->) and the FIND button is replaced with the SAVE button. Changes can be made to the rule displayed by directly changing the displayed fields. The AMIGA command-key shortcut RIGHT-A and X when typed into a string field will clear the field for a new entry. This is particularly useful when several characters are not displayed in a long field.

Once changes are made to the rule, it can be saved by clicking on the SAVE button. Clicking on the arrow buttons will go on to another rule without saving changes made. At any time, UNDO may be selected, and the most recent change will be undone. Selecting the QUIT button will return the rule editing window to the FIND state, removing the arrow buttons and changing the SAVE button to FIND again.

User Environment Display Options

MAGELLAN can now be opened a variety of ways:

- on the WorkBench™ (same as MAGELLAN v1.0)

This is useful when using an advanced display system, such as the Commodore 2024 Monitor, or the MONITERM VIKING™ system. These monitors extend the useful size of the WorkBench, but do not generally permit custom screens of the larger sizes (1008 x 800). This display option can also save valuable display memory if you're pushing your system's limit.

- on a custom screen, interlace or not.

This permits extended color for additional visual feedback, and the option of interlace mode can display twice as much data on the screen at once.

User Environment Command Options

MAGELLAN can be opened from the CLI, and now supports a variety of command line options.

One example is the WorkBench display option mentioned above. To open on the WorkBench, the user enters:

```
> magellan -w
```

on the command line.

Several other options such as loading a knowledgebase, creating a goal, attempting to resolve a goal, or clearing object attribute values can also be accomplished via the command line. This is useful in the creation of slave processes that can open a kbase, ask questions and PUT data into a file, all commanded from the CLI, either by typing them in, or as commands from another program.

The command-line options are:

LOAD directory filename

```
> magellan load kbases: amiga-diagnostics      (note the space between  
    'kbases:' and 'amiga-diagnostics': it is important!)
```

GOAL object attribute priority

```
>magellan goal possible failure 75            (this will eliminate current  
goals, so be very careful)
```

ATTEMPT

```
>magellan load kbases: amiga-diagnostics attempt
```


CLEAR

>magellan load kbases: amiga-diagnostics clear attempt

or a combination:

>magellan attempt load kbases: amiga-diagnostics goal possible problem
75 -w

would: open MAGELLAN up on the WorkBench
load the knowledgebase 'kbases:amiga-diagnostics'
create a goal 'possible' 'problem' with priority 75
attempt to resolve the created goal

An additional command line argument:

-i ---- opens MAGELLAN in interlace mode (may run out of memory in
512K CHIP memory machines if several windows displayed)

Front End Interfaces

In addition to the command-line interface added to Version 1.1, there is another way to command MAGELLAN from another program.

Using a port created as MAGELLAN opens, called MAGELLAN.PORT, commands may be passed directly into MAGELLAN's inner loop. This allows external processes to stimulate MAGELLAN in a variety of ways, and to cause MAGELLAN to perform many of its user options. This port can be accessed easily by AREXX™ compatible programs, and MAGELLAN will recognize commands passed to it in this fashion.

Menus, Control Window

Under MAGELLAN v1.0, users were forced to click into the CONTROL window to find a useable menu. This has been eliminated. An active menu can be found from most windows, and the display of rules, objects, etc., can be done at most times. This can be very useful when building rules or objects. Only at specific times in User Data Entry, Rule or Object Editing are other displays unavailable.

Control Buttons

Frequently used menu options: CLEAR ALL, BACKCHAIN, FORWARDCHAIN and ATTEMPT have been given buttons on the CONTROL window. These buttons are useful as alternatives to the menu items. Command-key sequences from V1.0 are still effective as well.

New File Requester

Numerous changes to the file requester have been made, and functions previously outside MAGELLAN (deleting a knowledgebase) have been added to the product. File extension filtering is now done to eliminate the confusing three-file-name problem. Note also that the default directory has been changed from RAM: to KBASES: at the suggestion of several users. If you are working with a single disk drive or without the KBASES: disk handy, do not despair. Simply assign KBASES: to RAM: and be done with the nagging.

To do this from the CLI, remove the KBASES: disk if it is already inserted, and enter:

```
>assign kbases: RAM:
```

Hard Drive Installation

Installation on a hard disk drive is quite simple, simply insert the MAGELLAN Program Disk into drive 0 (internal drive) and double click on the MAGINSTALL icon from WorkBench, or at the CLI:

```
>maginstall
```

Rule Editing/Creation Verification

MAGELLAN V1.0 was not very picky about entering rules; invalid rules could be entered, with problems possibly occurring downstream during inference. MAGELLAN V1.1 validates rule entry, indicating missing portions of newly created rules, and even checks edited rules for modifications that would make them invalid.

Useless Cells Deletion

Under 1.0 it was possible to create rules, which created cells, and then delete rules which left the cells intact, often leaving them useless and unattached. These cells are removed now with the next CLEAR ALL. The CURRENT object cells (real time cells) cannot be deleted.

Object Edit Options

Object editing is improved, and includes several new options:

LOCK- will protect an object from being cleared with clear-all

VARIABLE- will permit multiple character variable names (aliases) for a cell

DELETE- will provide checking for associated rules using a cell and delete if possible

INQUIRY- can contain the text of the GET command used to fill a cell value, or the name of a picture to show or text file to display.

Loop Inference Mode

Under version 1.0, inference was limited to two primary mechanisms: goal-directed backward chaining, when the user enters a goal to resolve and the system asks questions to fill in the 'gaps' of unknown information, and rule-based forward chaining, in which the system simply tests rules to see if there is any new data that would cause them to 'fire' or to add information to the knowledge structure. In LOOP mode, this rule-based forward chaining mechanism is left running until broken by the user.

Without the GET/PUT mechanism or the real-time clock, LOOP mode would be fairly useless, since new data could not 'get into' the system without MAGELLAN asking the user another question. Now however, if rules use information that can be obtained via a procedural "INQ" process (such as attaching a spreadsheet data retrieval to a object) the possibility exists for changes being made to the knowledgebase without user data entry.

A good example of this is using the new "CURRENT" "SECOND" object-attribute (or "CELL"). CURRENT SECOND is updated by MAGELLAN and always reflects the current time. A rule:

```
IF CURRENT SECOND > 45  
THEN SHOW PICTURE show kbases:AGNUS
```

would test the value of current second and if it was between 46 and 59 it would show the picture.

LOOP mode tests all such rules over and over, waiting for a change, in this case a change of the CURRENT SECOND, to trigger an event, such as showing a picture. Other uses include attaching other kinds of GET routines, such as processes to obtain process control values and reacting to changed data.

LOOP mode can be used with any rules, but makes the most sense when used in conjunction with either (a) rules using the 'CURRENT' object, such as current second, current hour, current day of the week, etc., or (b) rules using GET or GET# operators to change the values from outside MAGELLAN.

The 'Current' Object

MAGELLAN now provides a real-time capability using the internal clock of your AMIGA. Several cells are created using the current system time and are maintained for you. An OBJECT DISPLAY will only show a snapshot of these values, so be careful not to rely on it for the current time values. Cells created include:

- CURRENT ' YEAR ' (xxxx)
- CURRENT ' MONTH ' (1 to 12, January to December)
- CURRENT ' DAY OF THE YEAR ' (1 to 366)
- CURRENT ' DAY OF THE WEEK ' (1 to 7, Sunday to Saturday)
- CURRENT ' HOUR ' (0 to 23, 12 am to 11pm)
- CURRENT ' MINUTE ' (0 to 59)
- CURRENT ' SECOND ' (0 to 59)

Memory Checking

Active memory checking is performed for you, with MAGELLAN proactively closing display windows in a low-memory condition. Please beware of using the -i (interlace) option on 512K CHIP memory machines (all AMIGA's as of July,1989)- it is fine with a few windows open. With the new capability to open as many as eight or nine interlaced windows, full-screen, there just isn't enough memory left to go around. Two or three seem just fine, and the size of the knowledgebase is only a factor when FAST ram is unavailable (using an unexpanded Amiga 1000, for example). It is no longer possible to work effectively with MAGELLAN in 512K (A1000) machines. Closing the WorkBench, running from the CLI with stack set at 4-12K, may make it possible, but touchy.

Termination Options

Terminating MAGELLAN now provides options to SAVE the current knowledge base, and demonstrates the improved command-input requesters used throughout.

MAGELLAN Startup and New Knowledge Bases

Included on your KBASES: disk are several new knowledge bases, including VITAMINS and a new MAGELLAN-STARTUP knowledge base.

Convert from 1.0

Version 1.1 knowledgebases are almost unchanged from MAGELLAN version 1.0, there are, however, some problems. The addition of GET/PUT and the conversion from floating point emulation to IEEE double precision floating point has made floating point numbers incompatible between knowledge bases. At press time, the conversion utility on the MISC menu was incomplete, but a start. It will take thresholds and certainties from a Version 1.0 knowledgebase and convert them to 0.2 and 1.0 (just like automatic certainties). It will not change values that are part of rules, which must be re-entered. It will not handle the direct conversion of thresholds and certainties, only the setting to the defaults of 0.2 and 1.0. As an improved utility is available, it will be put up on the Bulletin Board System (BBS) for registered users. A printout from the rules display under Version 1.0 is very useful to help edit the floating point numbers in values, thresholds and certainties under 1.1.

MSGv1.1 and Menu Selection Text

Text in MAGELLAN v1.1 is read in from an ASCII file, including most menu text, messages and warnings. The purpose for this design is to simplify translation of MAGELLAN for foreign users. It also will permit the most unorthodox of our users to embellish or modify messages, warnings and text. We are denying all responsibility for these modified text files, so please don't call us about profane warning messages on Junior's AMIGA. We'd suggest not messing with the messages, as they may not work in all cases if they're modified.

MAHOGANY™

Emerald Intelligence has released its version of the MAGELLAN Expert System Tool for the Apple MACINTOSH computer. Somewhat different than MAGELLAN, MAHOGANY will be made available on several computer platforms, including the MAC, IBM PC compatibles, UNIX workstations and mainframes.

HYPERDOX™

HyperDox is a feature of Emerald Intelligence software, and is currently supported on the Apple Macintosh computer, and may soon be supported on the Commodore AMIGA computer as well. HyperDox is Hypermedia Documentation and is an on-line help and information system that uses a hypermedia software program, such as Apple's HYPERCARD™ to deliver extremely effective assistance to users. By clicking a HELP key, or another key-sequence, users can be placed into a rich hypermedia help subsystem. As a demonstration, assistance and training environment, HyperDox is a significant advance in user-friendly software design. Currently there are no completed hypermedia programs for the AMIGA, such as HYPERCARD on the MAC, but when there are, HyperDox will be activated.

The Future

The Version 1.1 upgrade was a long time coming and we greatly appreciate the feedback, support and patience all of you provided us. We eagerly look forward to your comments and questions. We have tried in

all areas to improve the usefulness, accuracy and quality of our product, but there may still be areas that are incomplete. Consider such areas as an open invitation to contact us with your input, without which we could not exist. We continue our commitment to the AMIGA market, and our commitment to MAGELLAN, which is as much a direction as it is a product.

Thank you for your continued support of Emerald Intelligence.

Sincerely,

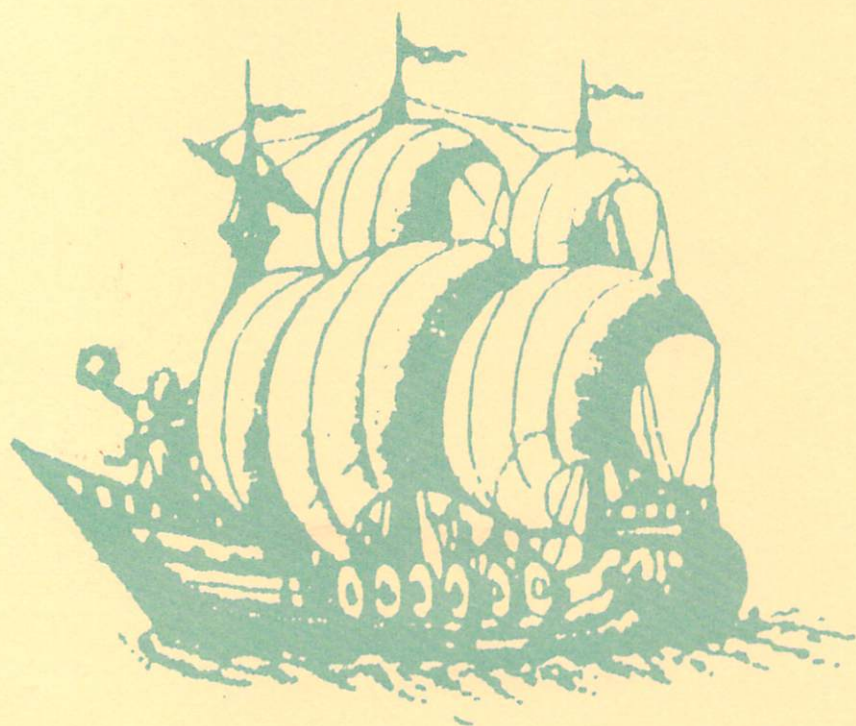
David M. Kennedy
President/CEO

Emerald Intelligence Inc.

Lotus MAGELLAN®

Not to be confused with Emerald Intelligence's MAGELLAN™, the product known as LOTUS MAGELLAN, from Lotus Development Corp., is not an artificial intelligence development tool. Emerald Intelligence released MAGELLAN v1.0 in July, 1988 and LOTUS Development Corp., released LOTUS MAGELLAN 10 months later in May, 1989. Emerald Intelligence retained the rights to the use of the name MAGELLAN™ in the Commodore market, worldwide, providing the following statement was provided with the use of this name:

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Emerald
Intelligence

3915-A1 Research Park Drive, Ann Arbor, MI 48108.